

**SOUTHWESTERN BELL  
TELEPHONE COMPANY**

**HIGH CAPACITY DIGITAL SERVICE  
(1.544 MB/S AND 44.736 MB/S)  
REQUIREMENTS AND TRANSMISSION LIMITS**

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If further information is required, please contact

Southwestern Bell Telephone Company  
Manager - Information Release  
1010 Market, Room 810  
St. Louis, Missouri 63101  
(314) 235-8300

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## 1. Introduction

### 1.1 Purpose

This document describes the specifications for MegaLINK III, MegaLINK Custom and High Capacity Special Access services provided by Southwestern Bell Telephone Company (SWBT) to its customers. MegaLINK III is a 1.544 Megabits per second (Mb/s) service offered by Southwestern Bell Telephone Company (SWBT) within individual LATAs. MegaLINK Custom is 45 Megabits per second (Mb/s) service offered within a LATA. High Capacity Special Access includes 1.544 Mb/s and 45 Mb/s services offered in the Access Tariffs to InterLATA customers.

Customers consist of Interexchange Carriers (ICs) and End Users (EUs). The document describes the services provided between an IC Point of Termination (IC-POT) and EU Point of Termination (EU-POT), between two IC-POTs or between two EU-POTs. This document amends specific sections of Bellcore TA-TSY-000342, High Capacity Digital Access Services. The names of the sections in both documents are the same while the actual number may be different.

### 1.2 Scope

This document defines technical requirements, transmission performance specifications and test requirements for 1.544 Mb/s or Digital Signal level 1 (DS1) service and 45 Mb/s or Digital Signal level 3 (DS3) service. All interface combinations for the IC-POT and EU-POT described in TA-TSY-000342 are not available in SWBT tariffs. The specific combinations offered by SWBT are listed in the SWBT Carrier Coding Guide (CCG).

### 1.3 Applicability of Technical Requirements

The technical requirements specified in this document apply to all high capacity digital services provided by SWBT. These services include circuits between an IC and the EU, between two IC locations, or between two EU locations.

### 1.4 Provision of Services

The services and options described in this document are available at locations where existing equipment and facilities permit. When the appropriate equipment and facilities are not available, the provision of the services may include Special Construction Charges as described in the applicable SWBT tariff.

## 2. General Information

### 2.1 References

This technical reference covers DS1 level and DS3 level services. These services will be provided consistent with American National Standards Institute (ANSI) specifications. This document will be reissued when needed to be consistent with the standards.

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In addition, this document is consistent with various Bellcore technical references where appropriate. Some references for the DS1 and DS3 services provided in this document are the following:

1. ANSI T1.102-1989. American National Standard for Telecommunications - Digital Hierarchy - Electrical Interfaces.
2. ANSI T1.107-1988. American National Standard for Telecommunications - Digital Hierarchy - Format Specifications.
3. ANSI T1.403-1989. American National Standard for Telecommunications - DS1 Carrier to Customer (CI) - DS1 Metallic Interface.
4. ANSI T1.404-1989. American National Standard for Telecommunications - DS3 Carrier to Customer Installation (CI) - DS3 Metallic Interface.
5. ANSI T1M1.3/1989 - 090, Layer 1 In-service Digital Transmission Monitoring, Draft Standard.
6. TR-TSY-000194, Extended Superframe Format Interface Specifications, Issue 1, Bellcore, December 1987.
7. TR-TSY-000054, High Capacity Digital Service (1.544-Mb/s) Interface Generic Requirements for End Users, Issue 1, Bellcore, February 1989.
8. TA-TSY-000342, High Capacity Digital Special Access Service, Transmission Parameter Limits and Interface Specifications, Issue 1, Bellcore, June 1989.

### 3. Technical Information

#### 3.1 General

These requirements describe the High-Capacity Digital Special Access Service signals delivered to the IC and the End-User. The Point Of Termination (POT) is the physical point where the access service begins and the division of responsibility occurs. The POT can be provided as a DSX-1 or DSX-3 per ANSI T1.102-1987 where possible. In these cases, the IC or EU must provide appropriate power and space for the Telephone Company provided equipment. In some DS1 arrangements, the POT will be provided as a non-DSX1 described in ANSI T1.403, Metallic DS1 interface specifications. Design information for this arrangement is provided in Bellcore TR-TSY-000054. In each case, the customer must provide access for any required maintenance and testing.

For DS3 service, the DSX-3 per ANSI T1.102-1987 will be provided. In all cases, the customer must provide access to the POT at all times for required maintenance and testing.

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### 3.2 Joint Engineering

If situations exist that prevent the hand-off of DSX templated signals at the DS1 POT, the design specifications for the interface must be determined as discussed in TR-NPL-000054. For some applications, joint engineering of this section will be required. The customer's signal must meet the loss requirements specified in that document.

### 3.3 Jitter

Jitter is short-term variations of the significant instants of the digital signal from their ideal positions in time. The magnitude of jitter is specified in terms of Unit Intervals (UIs). Output jitter at the POT will meet the specifications in TA-TSY-000342.

### 3.4 Delay

Circuit delay consists of two components: propagation delay and equipment delays. Equipment delay is contributed by protection switching devices, crossconnect systems and multiplexers. Propagation delay depends on the type and length of facilities.

Delay is not normally measured during the installation of the service; rather, it is considered in the design of the overall service. The delay for DS1 and DS3 services will be designed to be less than 10 milliseconds (msecs) round-trip delay.

## 4. DS1 Service Requirements

DS1 Service provides for transmission of nominal 1.544 Mb/s isochronous serial data between an IC-POT and an EU-POT, between IC-POT locations, between EU-POT locations, or between an IC-POT and a SWBT designated digital hub with multiplexing. Sections 4.1 - 4.4 replace the same sections in TA-TSY-000342.

### 4.1 Pulse Density

To ensure adequate timing recovery of the regenerative digital facilities, the following pulse density requirements must be met:

- In every time window of  $8(N+1)$  digit time slots (where  $N$  can equal 1-23), at least  $N$  ones must be present
- No more than 15 consecutive zeros.

### 4.2 Framing Formats

Southwestern Bell will provide DS1 service using either the Superframe Format (SF) or the Extended Superframe Format (ESF) for all services except U.S. Government services. SWBT will provide an "Unframed" signal for U.S. Government services when requested on the service order.

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For maintenance reasons, SWBT recommends the use of ESF on new services because of the superior performance monitoring and testing capabilities. The ANSI T1.403 provides technical information on the new standard ESF for DS1 services. Until the equipment is available that meets the new standard, equipment meeting the previous ESF format specified in TR-TSY-000194 can be used. The ANSI standard will be the only supported method for new services after January 1, 1991.

#### 4.3 Clear Channel Capability

The 64 Kilobit Clear Channel Capability provides the customer a method to transmit data that does not meet the constraints identified in section 4.1. The standard method to provide Clear Channel Capability is the use of Bipolar 8 Zero Substitution (B8ZS) encoding for the DS1. The technical requirements for the B8ZS encoding are provided in the ANSI T1.102 and the Bellcore TA-TSY-000342. B8ZS will be the only method used by SWBT to provide Clear Channel Capability.

The customer must convert the data strings to the B8ZS code and transmit this data to SWBT at the POTs. Many Channel Service Units are available with the B8ZS option so that the customer data can be converted to the proper codes.

#### 4.4 Performance Objectives

This subsection covers the performance and availability parameters for the DS1 service. The definitions stated here are taken from the T1Q1.3/89-090 draft standard, Layer 1 In-service Digital Transmission Monitoring.

Cyclic Redundancy Check (CRC-6) Error - The CRC-6 error applies to DS1 facilities using the ESF framing format. It is the occurrence of a received CRC-6 code that is not identical to the locally-calculated code.

Errored Second (ES) - An (ES) is any one-second period containing one or more, bit errors, CRC-6 errors or framing bit errors.

Severely Errored Second (SES) - A (SES) is any second where the number of bit errors exceeds the ratio of 1 in 1000 bits. SESs are also defined as the count of one-second intervals with 320 CRC-6 errors in one second.

Consecutively Severely Errored Seconds (CSES) - A (CSES) is an event of 3 to 9 consecutive SESs.

##### 4.4.1 Availability

Availability is a measure of the relative amount of time that a service is "usable" to the customer. A service is unavailable when 10 consecutive SESs are received. The service becomes available again when no SESs are received in 10 seconds.

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Availability is impacted by the amount of time a service is out of service for repair action. The service is considered unavailable when it is reported for trouble and the telephone company finds that the circuit fails to meet the maintenance limits specified in other sections. The Availability objective for DS1 service is:

- 99.975 % Availability when averaged over 3 months.

#### 4.4.2 Acceptance Criteria

Acceptance Testing is done at the time the service is installed for the customer. Three test patterns will be used in testing the service depending on whether clear channel capability is provided. If the customer requests 24 hour testing, only the Quasi Random test will be performed for 24 hours. The other two tests will be performed for 5 minutes each.

For non-Clear Channel services with the Alternate Mark Inversion (AMI) line code the following tests will be performed:

3-in-24 test for 5 minutes,

All 1's test for 5 minutes, and

Quasi Random for 15 minutes.

For Clear Channel services using the B8ZS line code the following tests will be performed:

1-in-8 test for 5 minutes,

All 1's test for 5 minutes, and

Quasi Random for 15 minutes.

The 3-in-24 (3 Ones for 24 bits) test for Alternate Mark Inversion (AMI) signals and the 1-in-8 test for the B8ZS signal stress the DS1 service to the maximum number of consecutive zeros that will be transmitted on the line. The all 1's signal causes the DS1 line equipment to utilize the maximum power for any transmitted data. This pattern stresses the equipment to verify the maximum power that can be supplied to the line.

The performance limits specified in the following sections will be met on the large majority of services. However, there may be locations in SWBT that can not support the stringent requirements. For these service requests, the customer will be notified that the facilities at this location can not meet the limits specified in this document. In these cases, the customer can request new facilities to be constructed for the service at the Special Construction charges in the applicable tariff.



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If the customer does not want special construction for services at these locations, service will be provided that meets the existing limits specified in TA-TSY-000342. The 24 hour acceptance objective is specified below as "other". Complete acceptance test requirements are listed in the TA-TSY-000342.

The test limits for 24 hour and 15 minute tests are as follows:

Error Free Seconds	99.75% (24 Hours). 98.75% (24 Hours) for locations shown as other.
Errored Seconds	217 ES (24 Hours) 3 ES (15 Minutes) 2 ES (5 Minutes)
Severely Errored Seconds	3 (24 Hours) 0 (15 Minutes)
Consecutively Severely Errored Seconds	1 (24 Hours) 0 (15 Minutes)

SWBT will perform the two 5 minutes tests once, and the 15 minute (QRSS) test twice. The circuit will be accepted if all the test results meet or are within the acceptance limits. If the test results from any one test do not meet the acceptance limits, the failed test will be repeated. If the second test passes, the circuit will be accepted. If the second test fails, the circuit will be repaired and all acceptance tests will be repeated.

#### 4.4.3 DS1 Maintenance Test Limits

The maintenance limits specified below indicate the need for immediate maintenance action. These limits represent the minimum performance level for the DS1 service.

Errored Seconds	363 ES (24 Hours) 6 ES in 5 Minutes. 60 ES in 5 Minutes for locations shown as other.
Severely Errored Seconds	4 SES (24 Hours)
Consecutively SESs	2 (1 Month)

#### 5. DS3 Service Requirements

DS3 Service provides transmission of nominal 44.736-Mb/s isochronous serial data between the IC-POT and an EU-POT, between IC-POT locations, between EU-POT locations, or between an IC-POT

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and a SWBT designated hub where multiplexing is offered. This section specifies the technical requirements for DS3 Access Service provided by Southwestern Bell Telephone Company. It is used as a reference when requesting service from the EU-POT to the IC-POT or another EU-POT.

### 5.1 Electrical Interface

Southwestern Bell will provide the DS3 electrical interface that meets ANSI T1.102-1987 and ANSI T1.404-1989. SWBT will provide a DSX3 frame for testing at the interface.

### 5.2 Format

Southwestern Bell will provide DS3 service that meets the format specifications in ANSI T1.107-1989. Normally, SWBT will not use the C-Bit Parity application discussed in the standard and SWBT will pass the information through the network. However, future customer applications may benefit from the network's use of the C-bit parity. This section may be updated if changes are made in the network's use of this information.

### 5.3 Performance Objectives

For DS3 services, the performance can be measured on the service on an in-service or out-of-service basis. The performance parameters are as follows:

Errored Second (ES) - An (ES) is any second in which a bit error or a P-bit parity error occurs in the received line signal. The P-bit parity is part of the standard DS3 line signal defined in the previous sections.

Severely Errored Second (SES) - An (SES) is any second containing 44 or more bit errors or P-bit parity violations.

Consecutively Severely Errored Seconds (CSES) - A (CSES) is an event of 3 to 9 consecutive SESs.

#### 5.3.1 Availability

Availability for the DS3 service is defined the same for DS3 as it was in section 4.4.1 for DS1 service. The objective is:

- 99.975 % availability as averaged over 3 months.

#### 5.3.2 Acceptance Criteria

The acceptance test requirements for DS3 service are based on newer facilities that have been placed in the network over the past several years. Some locations in Southwestern Bell have facilities that cannot meet these limits. For these service requests, the customer can request Special Construction of the facilities at charges specified in the applicable tariff.

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If the customer does not want special construction and SWBT does not plan to install newer facilities, the customer will be notified shortly after the service is ordered and provided with the less stringent acceptance tests limits specified in the TA-TSY-000342. The 24 hour performance objective for these facilities is specified below as "other."

The standard test interval for the DS3 service is 40 minutes for the Quasi Random signal test. SWBT will perform the 40 minute acceptance test once. If the test results meet or are within the acceptance limits, the circuit will be accepted. If the test results do not meet the acceptance limits, the test will be repeated. If the second test passes, the circuit will be accepted. If the second test fails, the circuit will be repaired and the acceptance test repeated. Although 24 hour testing is not considered a part of the acceptance testing process, SWBT will guarantee the 24 hour test limits.

Error Free Seconds	99.9% (24 Hours) - new facilities 99.0% (24 Hours) - other.
Errored Seconds	86 ES (24 Hours) - New facilities 2 ES (40 Minutes) - New facilities.
Severely Errored Seconds	3 SES (24 Hours) - All facilities 0 SES (40 Minutes) - All facilities
Consecutive SESs	1 CSES (24 Hours) - All facilities 0 CSES (40 Minutes) - All facilities

### 5.3.3 DS3 Maintenance Test Limits

The maintenance test limits indicate the need for immediate maintenance action. These limits represent the minimum performance level for the DS3 service.

Errored Seconds	864 ES (24 Hours) new facilities 10 ES (15 Minutes) new facilities 40 ES (1 Hour) new facilities  100 ES (40 Minutes) - other.
Severely Errored Seconds	4 (24 Hours)
Consecutive SESs	2 (One month).

## 6.0 Maintenance Actions

### 6.1 General

When the DS1 or DS3 service is taken out of service for maintenance action, the performance levels will be returned to the acceptance limits before returning the service to the customer. The standard acceptance tests and intervals described in the previous sections will be performed.

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NOTES

## **ATTACHMENT B**

Part 68 of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

1. The authority citation in Part 68 continues to read:

AUTHORITY: (47 U.S.C. 151, 154, 155, 201-205,  
208, 215, 218, 226, 303, 313, 314, 403, 404, 410,  
522, 610).

2. Subpart A is amended by revising section 68.3, to read as follows:

### **Section 68.3 Definitions.**

\*\*\*\*\*

Digital terminal: A digital device operating at a 1.544 Mbps or lower rate which contains voice channel equipment terminating in the public switched telephone network or which interconnects the public switched telephone network with a cable exceeding 1500 feet in length.